

Japanese Patent Laid-open Publication No. HEI 5-336599 A

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Applicant : FUJITSU LIMITED

Title : AUDIO IMAGE FIXING POSITION HEADPHONE AND VIRTUAL

5 REALITY AUDIO-VISUAL APPARATUS BY THE USE OF IT

(57) [ABSTRACT]

[OBJECT]

To provide a headphone, by which a user thereof can
10 fix a position of an audio image with respect to a headphone
apparatus.

[CONSTITUTION]

According to the headphone of the present invention,
providing a plurality of speakers (1 to 9) to be driven
15 independently in a left and a right headphones (10L, 10R),
respectively, a position of an audio image can be fixed.
Further, providing means (13) for detecting a position and
a direction of the above described audio image fixing position
headphone apparatus one by one, means (11, 12) for supplying
20 a driving signal to the above described plural sound sources
so that a real audio fixed position is given to a person,
who is fitted with the above described headphone apparatus,
maybe combined with virtual reality audio-visual apparatuses
(14, 11, 12) to be provided. Alternatively, a plurality of
25 microphones (1" to 5") are disposed on exterior of the

headphone, respectively, and a plurality of speakers (1 to 5) are disposed in a position, which is associated with each of the microphones, in interior of the headphones. Then, electric signals of sounds, which are received by each of the microphones, are amplified. After that, a plurality of driving circuits (1' to 5') are provided to drive each of the sound generation sources, which are associated with the amplified electrical signals.

10 [DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[TECHNICAL FILED TO WHICH THE INVENTION PERTAINS]

The present invention relates to a headphone apparatus, and more specifically to a headphone, in which a plurality of speakers are disposed to be driven independently each other therein, for making a listener perceive a fixed portion of an audio image.

Japanese Utility Model Laid-open Publication No. HEI 3-115500

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Publication date : November 28, 1991

Applicant : Nihon Denki Home Electronics K.K.

5 Title : SOUND FIELD REPRODUCING APPARATUS

2. Scope of Claims for Utility Model Registration

(1) A sound field reproducing apparatus comprising:

10 a decoder for dividing a stereo signal having plural
channels into a left channel, a right channel, a center channel
and a surround channel signal;

a first and a second filter circuits for passing each
of said left channel signals with having an input side in
common;

15 a third and a fourth filter circuits for passing each
of said right channel signals with having an input side in
common;

a fifth and a sixth filter circuits for passing each
of said center channel signals with having an input side in
20 common;

a seventh and an eighth filter circuits for passing
each of said surround channel signals with having an input
side in common;

a first adder for adding a passing signal from said
25 first, third, fifth and seventh filter circuits and outputting

a signal for a left channel headphone; and

a second adder for adding a passing signal from said second, fourth, sixth and eighth filter circuits and outputting a signal for a right channel headphone;

5 wherein, when said left, right, center and surround channel signal drive left, right, center and surround channel speakers, respectively, and a symmetrical position between each of these speakers is defined to be a listening position;

 said first and second filter circuits have a transfer
10 property as same as a transfer property $H_{LL}(\omega)$ and a transfer property $H_{LR}(\omega)$ from said left channel speaker to a left side listening point and a right side listening point of said listening positions;

 said third and fourth filter circuits have a transfer
15 property as same as a transfer property $H_{RL}(\omega)$ and a transfer property $H_{RR}(\omega)$ from said right channel speaker to a left side listening point and a right side listening point;

 said fifth and sixth filter circuits have a transfer
property as same as a transfer property $H_{CL}(\omega)$ and a transfer
20 property $H_{CR}(\omega)$ from said center channel speaker to a left side listening point and a right side listening point; and

 said seventh and eighth filter circuits have a transfer
property as same as a transfer property $H_{SL}(\omega)$ and a transfer
property $H_{SR}(\omega)$ from said surround channel speaker to a
25 left side listening point and a right side listening point.

(2) A sound field reproducing apparatus according to claim 1, wherein a level adjusting circuit for varying a passing signal level is connected to said first to eighth filter circuits in series.

5 (3) A sound field reproducing apparatus according to claim 1 or 2, a ninth filter circuit having a transfer property $HHL(\omega)^{-1}$ or $HHR(\omega)^{-1}$, which is an inverse signal of a transfer property $HHL(\omega)$ or a transfer property $HHR(\omega)$ from an acoustic pronunciation portion of said left and right channel
10 headphones to a left side listening point and a right side listening point is formed on a passing signal line of said first to eighth filter circuits.

(4) A sound field reproducing apparatus according to any one of claims 1 to 3, wherein, when said seventh and eighth
15 filter circuits are divided into a first to a thirteenth filter circuits and said surround channel speaker is divided into a left and a right surround channel speakers,

said tenth and eleventh filter circuits have a transfer property as same as a transfer property $HSL L(\omega)$ and a transfer
20 property $HSL R(\omega)$ from said left surround channel speaker to said left side listening point and said right side listening point,

said twelfth and thirteenth filter circuits have a transfer property as same as a transfer property $HSRL(\omega)$
25 and a transfer property $HSRR(\omega)$ from said right surround

channel speaker to said left side listening point and said right side listening point, and

said tenth and twelfth filter circuits are connected to said first adder and said eleventh and thirteenth filter circuits are connected to said second adder.

(5) A sound field reproducing apparatus according to any one of claims 1 to 4, wherein a third adder for adding said center channel signal is connected to a front side of said first and second filter circuits in series, a fourth adder for adding said center channel signal is connected to a front side of said third and fourth filter circuits in series and said fifth and sixth filter circuits are omitted.

4. BRIEF DESCRIPTION OF DRAWING

Fig. 1 is a block diagram showing a sound field reproducing apparatus according to a first constitution of the present device. Fig. 2 is a view for theoretically explaining the first constitution of the present device. Fig. 3 is a block diagram showing a sound field reproducing apparatus according to a second constitution of the present device. Fig. 4 is a block diagram showing a sound field reproducing apparatus according to a third constitution of the present device. Fig. 5 is a view for explaining the third constitution of the present device. Fig. 6 is a block diagram showing a sound field reproducing apparatus according to a

fourth constitution of the present device. Fig. 7 is a view for explaining the fourth constitution of the present device. Fig. 8 is a block diagram showing a sound field reproducing apparatus according to a fifth constitution of the present device.

1...VTR main body

3...decoder

5...first filter circuit (filter circuit),

7...second filter circuit (filter circuit),

10 9...third filter circuit (filter circuit),

11...fourth filter circuit (filter circuit),

13...fifth filter circuit (filter circuit),

15...sixth filter circuit (filter circuit),

17...seventh filter circuit (filter circuit),

15 19...eighth filter circuit (filter circuit),

21...first adder (adder),

23...second adder (adder),

25, 27...amplifier,

29...left channel headphone,

20 31...right channel headphone,

33...L channel speaker

35...R channel speaker

37...C channel speaker

39...dummy head,

25 41...left side microphone,

43...right side microphone,
45...S channel speaker,
47 to 61...level adjusting circuit,
63, 65...ninth filter circuit (filter circuit),
5 67...tenth filter circuit (filter circuit),
69...eleventh filter circuit (filter circuit),
71...twelfth filter circuit (filter circuit),
73...thirteenth filter circuit (filter circuit),
75...left S channel speaker
10 77...right S channel speaker
79...third adder (adder),
81...fourth adder (adder)